USEPA Correspondence on St. Louis Army Ammunition Plant (SLAAP) Environmental Baseline Survey (EBS) Background Study

-----Original Message-----
From: Jefferson.Matthew@epamail.epa.gov
[mailto:Jefferson.Matthew@epamail.epa.gov]
Sent: Monday, June 29, 2009 8:44 AM
To: Newton-lund, Josephine M NWK
Cc: barry.mcfarland@usar.army.mil; Scott, Jesse; fcade@pe-engrs.com
Subject: Re: SLAAP Site-Specific Environmental Baseline Study- CD

Josephine,

Thanks again for sending the SLAAP EBS CD. After review, there are various problems with the background study:

*   Only 10 background samples were collected.
*   In most cases, because of rejected data or outlying concentrations, the constituents have less than 10 data points.
*   It doesn't appear that any QC samples were collected.
*   All of the background samples were collected from 0-0.5 ft depth. Therefore, it is inappropriate to compare subsurface samples to the representative background concentrations (as performed in the RI).
*   The 95% UTL was used as the representative background samples. It is EPA's preferred method that the 95% UCL be used instead.
*   The 95% UTL exceeded the maximum concentration for each and every constituent (for both metals and PAHs). It appears the 95% UTLs were incorrectly calculated using the outliers that were eliminated. An example of this is presented below.
*   The 95% UTL (i.e., background concentration) for arsenic was 13.2 mg/kg, but the individual background concentrations for arsenic were all below 13.2 mg/kg, as follows:

    *   3.4 mg/kg, 5.1 mg/kg, 5.3 mg/kg, 5.7 mg/kg, 6.3 mg/kg, 6.8 mg/kg, 7.4 mg/kg, 8.1 mg/kg, 10 mg/kg

In summary, the background concentrations that were used in the screening process were calculated incorrectly and cannot be used as representative background concentrations in this RI. Any and all references and calculations using the background data should be revised accordingly. Let me know if you'd like to schedule a conference call to discuss.

Thanks!
Matt

Matthew Jefferson
Superfund Remedial Project Manager
US EPA Region 7
(913) 551-7520
(913) 551-9520 (fax)
Jefferson.Matthew@epa.gov

From: "Newton-lund, Josephine M NWK"
<Josephine.M.Newton-lund@usace.army.mil>
To: Matthew Jefferson/R9/USEPA/US@EPA, "Scott, Jesse"
<jesse.scott@dnr.mo.gov>, <barry.mcfarland@usar.army.mil>
Date: 06/11/2009 02:13 PM
Subject: SLAAP Site-Specific Environmental Baseline Study- CD

Matt, Jesse and Barry,

A CD containing the SLAAP Site-Specific Environmental Baseline Study Feb.
2004 is being mailed to each of you via regular mail.

Please let me know if you do not receive this by early next week.

Thank you,
Josephine

Josephine Newton-Lund, PMP
Senior Project Manager
Environmental Branch
U.S. Army Corps of Engineers, Kansas City District
601 East 12th Street/CENWK-PM-ES
Kansas City, MO 64106
816-389-3912
816-289-1420 (cell)
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USEPA Correspondence on St. Louis Army Ammunition Plant (SLAAP) Background Issue

From: Jefferson.Matthew@epamail.epa.gov [mailto:Jefferson.Matthew@epamail.epa.gov]
Sent: Wednesday, August 05, 2009 10:51 AM
To: Maly, Andrew R CIV USA
Cc: Josephine.M.Newton-lund@usace.army.mil; English, Chris/STL; jesse.scott@dnr.mo.gov; fcade@pe-engrs.com
Subject: Hanley: SLAAP Background Issue

Hi Andrew,

Thanks again for giving us the opportunity to discuss and review the alternative in your email to resolve the background issues in the RI with Hanley/SLOP site. The heart of concerns lay on the methodology used to calculate the representative background concentrations for the COPCs in the RI is similar to a CERCLA-like project, even though this is a non-NPL site. EPA would like offer another alternative to resolving the background issue:

1.   Remove the outliers from the population and then recalculate the background statistics.
2.   Eliminate the 95% UTL and calculate the 95% UCL to be used as the representative background population for each constituent.

Please let us know if you'd like to set up a conference call to discuss or clarify this alternative.

Thanks!
Matt

From	"Maly, Andrew R CIV USA" <andrew.maly@us.army.mil>
To	Matthew Jefferson/R9/USEPA/US@EPA
Date.	07/21/2009 10:23 PM
Subject	FW: SLOP (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Matt,

Some information for consideration. Please let me know if this will work for your team, and I'll get this finalized.

Thank you,

Andrew

-----Original Message-----

From: Chris.English@CH2M.com [mailto:Chris.English@CH2M.com]
Sent: Tuesday, July 21, 2009 3:33 PM
To: Josephine.M.Newton-lund@usace.army.mil; Maly, Andrew R CIV USA
Cc: Barrie.Selcoe@CH2M.com
Subject: RE: SLOP

Josephine and Andrew,

I discussed USEPA's proposal with Barrie Selcoe, our human health risk
assessor. USEPA is making a reasonable request, provided that we can
agree on some boundary conditions for the post-remedial action (RA)
human health risk assessment (HHRA). We are proposing these conditions
in order to meet USEPA's request without performing a complete "re-do"
of the HHRA. Here are the conditions we propose:

Item 1

The post-RA HHRA will not require a recalculation of groundwater risks,
even if more recent groundwater data (post-2008) are obtained as part of
the RA.

Item 2

The post-RA HHRA will provide post-excavation risk estimates for
potential site-related chemicals as well as those chemicals within
background levels. The following information will be used to provide
residential risk estimates for Exposure Units A through L:

1.   Quantitative risk estimates for Exposure Units A through
L
presented in Table 7-1 of the draft final RI Report. These estimates do
not include chemicals whose concentrations were below SLAAP background
levels.

2.   Risk estimates presented in Appendix R (HHRA Background
Concentrations for COPCs) of the draft final RI Report for chemicals
exceeding SLAAP background levels (and above MSSLs) in Exposure Units A
through L.

3.   On a unit-by-unit basis, the sum of the risk estimates
in #1 and
#2 (above) correspond to the total risk for each residential exposure
unit (A through L) at the former Hanley Area, assuming that the "hot
spot" areas identified in Section 5.7 of the RI are excavated.

4.   During the FS process, additional areas of soil (beyond
the
hot-spot areas identified in the RI report) will be identified as
requiring remediation (soil removal) due to thallium concentrations.
The thallium hazard quotients (HQs) associated with the original samples
in these excavated areas will be subtracted from the original hazard
index (HI) for each applicable exposure unit (#3 above), yielding the
exposure unit HI that remains after the soil removal is completed.
Since thallium is not associated with carcinogenic effects, original
cancer risk estimates will remain unchanged.

Item 3

We have assumed that confirmation soil sample data will not be incorporated into the post-RA HHRA. This assumption is reasonable because the soil removal areas will be excavated until risk-based preliminary remediation goals (PRGs), identified in the FS, are achieved.

Summary

CH2M HILL recommends that the Army accept USEPA's proposal under the conditions cited above. If you have any questions regarding this information, please let me know.

Thanks,

Chris

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
US ARMY ENVIRONMENTAL COMMAND
5179 HOADLEY ROAD
ABERDEEN PROVING GROUND, MD 21010-5401

September 11, 2009

Cleanup Division

Mr. Matthew Jefferson
U.S. Environmental Protection Agency
Region VII
901 North 5th St.
Kansas City, Kansas 66101

Dear Mr. Jefferson:

Enclosed is a technical memorandum prepared by CH2MHill for the United States Army Corps of Engineers – Kansas City District. CH2MHill is under contract, through Conti Federal Services, Inc., to the Army to perform environmental remediation work at the former Hanley Area site of the Saint Louis Ordnance Plant (SLOP).

The memorandum outlines the process used to calculate background values for the former Hanley Area site at SLOP. As indicated in the memorandum, the data was recommended for use by the Missouri Department of Natural Resources (MDNR) and the process used was approved by MDNR. The memorandum, which will be included as an appendix to the Remedial Investigation report, also summarizes the justification for why this process is appropriate for the former Hanley Area site.

To date, the Army and EPA have not been able to come to an agreement on the approach used per the Remedial Investigation work plan, and described in the Remedial Investigation report for the former Hanley Area at the SLOP. As the lead agency on this project, per Executive Order 12580, the Army intends to finalize the Remedial Investigation report and proceed with the CERCLA process.

The Army believes that finalizing the report and proceeding with the Feasibility Study is the preferred approach because there are known remedial actions that must be taken at the facility. Based on the location of the former Hanley Area site and its potential reuse options, the Army does not want to delay cleanup. Based on sampling data collected at the site, cleanup actions are designed to remediate soil to levels that are protective of human health and the environment.

Additionally, the site will most likely be subject to five-year reviews based on groundwater cleanup requirements that may result in contaminants remaining above cleanup levels for a period of time. The five-year review process may provide an opportunity for additional discussion of this issue, while allowing cleanup to proceed to address potentially more significant cleanup areas without undue delay.

The Army requests that you review the technical memorandum and notify the Army as to whether this provides sufficient explanation for our approach. Notification of concurrence/non-concurrence is requested so that this may be appropriately noted in the project records.

Regardless of your decision, we appreciate your effort as a member of the cleanup team for the former Hanley Area of the SLOP, and look forward to your continued input on the project.

I am forwarding a copy of this letter to Mr. Jesse Scott, Missouri Department of Natural Resources, 917 N. Highway 67, Florissant, MO 63031; Mr. Dave Moore, 88th Regional Support Command, (ARRC-SWI-EN), 60 South O Street, Fort McCoy, WI 54656; Mrs. Josephine Newton-Lund, U.S. Army Corps of Engineers, Kansas City District, CENWK-PM-ED, 601 East 12th Street, Kansas City, MO 64106; Mr. Chris English, CH2MHill, 1034 S. Brentwood Blvd., Suite 2300, Richmond Heights, MO 63117; and Mr. Luis Sejido, Conti Federal Services, Inc., One Concord Farms, 490 Virginia Road, Concord, MA 01742

Sincerely,

James D. Daniel
Chief,
Cleanup Division

Enclosure

Evaluation of Background Concentrations Used in the St. Louis Army Ammunition Plant Environmental Baseline Survey

PREPARED FOR: U.S. Army Corps of Engineers – Kansas City District

PREPARED BY: CH2M HILL

DATE: August 20, 2009

In the remedial investigation (RI) report for the former Hanley Area at the St. Louis Ordnance Plant (CH2M HILL 2009), the U.S. Army used background concentrations for metals and select polycyclic aromatic hydrocarbons (PAHs) as screening levels. The background concentrations were developed during an environmental baseline survey at a nearby industrial site, the St. Louis Army Ammunition Plant (SLAAP). The values were recommended for the former Hanley Area by the Missouri Department of Natural Resources (MDNR) during its review of the draft final RI work plan. The SLAAP background concentrations were a source of the screening levels presented in the final RI work plan (CH2M HILL 2008), which MDNR approved in a letter dated May 19, 2008.

During its review of the draft final RI report for the former Hanley Area, USEPA expressed concern regarding the use of the SLAAP background values as screening levels. In its most recent correspondence, dated August 5, 2009, USEPA offered the following recommendations regarding the use of the SLAAP background values:

1. Remove the outliers from the population, then recalculate the background statistics.

2. Eliminate the 95 percent upper tolerance limit (UTL), and calculate the 95 percent upper confidence limit (UCL) to be used as the representative background population for each constituent.

This memorandum was prepared in response to USEPA's correspondence. It demonstrates that outliers were removed from the SLAAP background sample population before calculating background statistics, and it explains why the 95/95 UTL is an appropriate statistical metric for calculating background concentrations.

Source Data and Removal of Outliers

The background concentrations used in the RI originally were presented in the May 2004 *Site-specific Environmental Baseline Survey, St. Louis Army Ammunition Plant, St. Louis, Missouri* (URS 2004). Ten surface soil samples were collected from local municipal parks to calculate regional background levels of metals and PAHs. The regional background concentration was defined as the 95 percent upper confidence limit for 95 percent of observations (95/95 UTL).

Before calculating the 95/95 UTLs, outliers within the sample population were identified and removed using Dixon's Extreme Value Test (URS 2004). Outliers are represented in

italics in Table 4-1 of the environmental baseline survey report. The remaining data were confirmed to be normally distributed by the Studentized Range Test (URS 2004).

In response to USEPA's concerns cited above, no additional adjustment to the sample population is warranted.

Upper Confidence Limits and Upper Tolerance Limits

The following subsections define and contrast two statistical estimators, designated "UCL of the mean" and "UTL," as they relate to evaluations of background, and specifically the SLAAP background values used in the former Hanley Area RI. It is important to note that the utilities of these two statistics do not overlap one another. Instead, they each serve different purposes, and attempts to use either as a replacement for the other signals an errant approach.

Differences between UCL of the Mean and UTL

The primary difference between a UCL of the mean and a UTL is the statistical parameter being estimated. The UCL of the mean is an important statistic in risk assessments, because it serves as the conservative estimate of the mean to be compared to a risk-based value. Being such a common environmental statistic, it has become routine simply to refer to this statistic as the UCL. However, since virtually any statistical parameter can have a UCL as a conservative estimate, casually referring to the "UCL of the mean" as simply the "UCL" can reduce clarity and introduce confusion.

Indeed the UTL, or upper tolerance limit, is itself an upper confidence limit. The UTL is an upper confidence limit of an elevated percentile (such as the 95th percentile). The use of the word "tolerance" in this context should not be confused or combined with other uses of the word, such as engineering "tolerances." The UTL in environmental circles refers to an upper confidence limit of an elevated percentile.

The two statistics describe different parameters and thus answer different questions about a population. The UCL provides information about the center of the distribution while the UTL deals with the upper tail of the distribution. Thus the UCL is useful for a conservative test of whether the mean exceeds some constant threshold, such as a risk screening threshold. The UTL is appropriate for comparing to individual values (e.g., site sample results) to see if they are likely members of a population equivalent to the one which produced the UTL. An example of this is a UTL calculated from a background dataset used to compare to individual site values. If a site value exceeds the background UTL, then it represents an elevated result with respect to the background data.

Thus, with regard to the SLAAP background population, one can summarize use of the UCL and UTL as follows:

- The UCL can be used in determining whether the mean of a population exceeds a risk-based threshold.

- The background UTL is used in determining whether individual values appear unusually elevated relative to the background population.

These different limits have long caused confusion, but their distinct statistical identities have always been consistent. For instance, older guidance (USEPA 1992) stated that "[t]hough often confused, the interpretations and uses of these intervals are quite distinct." More recently, the technical guide for ProUCL software, written under contract for USEPA (2009), states, "It is important to understand and note the differences between the uses and numerical values of these statistical limits so that they can be properly used. Specifically, the differences between . . . UCLs and UTLs should be clearly understood and acknowledged."

Graphical Interpretation of UCL of the Mean and UTL

A graphical presentation of the UCL and UTL can help reinforce their differences. First, it is appropriate to introduce the concept of skewed data. Some data, such as those adhering to a normal distribution, are symmetrically distributed. Many times, data tend to be skewed, and with environmental applications this skewness tends to be to the right (toward more elevated concentrations). Types of distributions are depicted in Figure 1.

FIGURE 1
Comparison of Symmetrical and Skewed Distributions


Symmetrical   Skewed Right
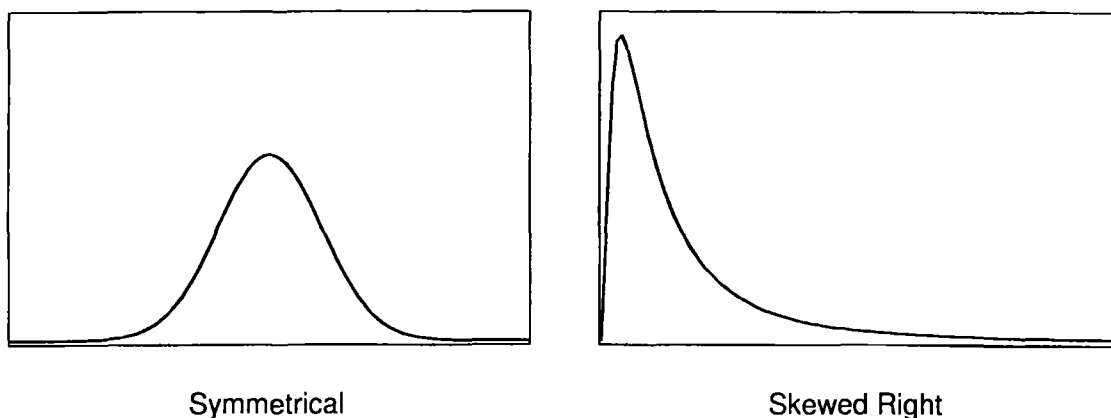
If one considers a normal distribution (which is symmetrical), a relatively simple depiction of a UCL of the mean and a UTL can be provided. The curve in Figure 2 represents the distribution of a normally distributed population with a true mean of 10 and a true standard deviation of 2. The true mean and true 95th percentile are marked on the plots. Also shown on the plot are a potential 95 percent (confidence) UCL and a potential 95 percent (confidence) UTL (of the 95th percentile).

Both the UCL and UTL drawn on Figure 2 represent larger values than the true mean or true 95th percentile, respectively. (For graphical convenience, this example with relatively low variability is used. If the variability is larger, the UCL and UTL typically exceed the true mean and true 95th percentiles, respectively, by larger amounts.) This is the condition one typically would expect since these statistical estimates are upper confidence limits of the true parameters. Since the confidence of both estimators is 95 percent, one would expect that the UCL, or UTL, (which is calculated based on a collection of sample sets from the overall population) would be larger than the true mean, or true 95th percentile, 19 of 20 times (95 percent). One out of 20 times, however, one would expect that the UCL, or UTL, would fall below the true mean, or true 95th percentile. Whether this occurred or not, the UTL for a

given sample set would still be expected to be a larger value than the UCL of the mean, since the 95th percentile is greater than the mean.

FIGURE 2
A Normal Distribution with Mean = 10 and Standard Deviation = 2, Showing Typical Positions of UCL and UTL
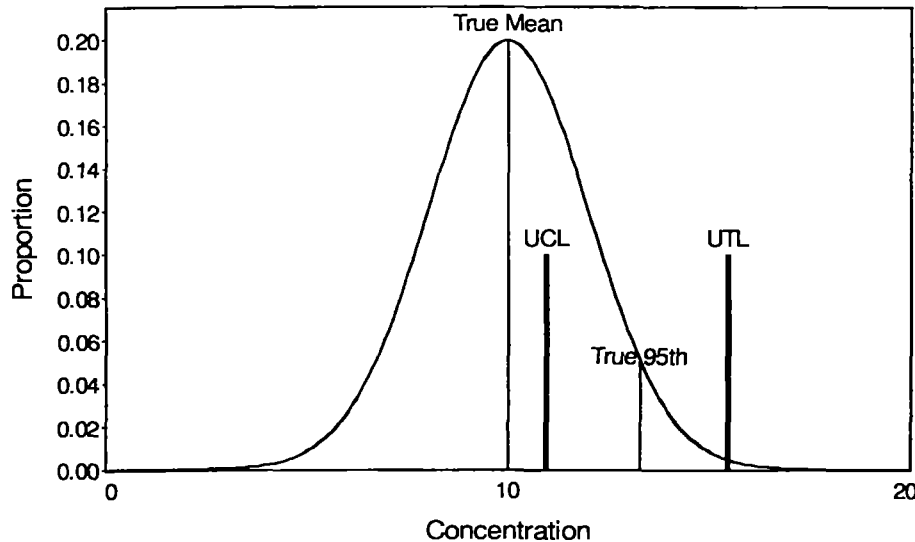
With Figure 2 in mind, one has a visual reminder of how it is inappropriate to compare the mean to the UTL (since the UTL estimates a value notably higher than the mean) or individual values to the UCL (since a substantial portion of the population exceeds the UCL).

Impact of Skewness

Many environmental populations are not as symmetrical as the normal distribution but instead are skewed to the right (the longer tail of the distribution appears to the right). With right-skewed populations, the problem of misapplying UCLs and UTLs can become even more dramatic than with the symmetrical presentation in Figure 2. With such distributions, the difference between correctly calculated UCLs and UTLs can become even greater.

The skewness of the data, along with the number of background samples and the variability in the results, also affects whether the maximum result in the background sample set exceeds the calculated UTL. These various factors will alter the odds of having the UTL be higher than the maximum detected result used in calculating the UTL. There are many datasets in which a correctly calculated UTL will exceed the maximum detected value. The skewness will also affect the mathematical assignment of outliers to be considered for exclusion.

Use of 95/95 UTLs for Calculating Background Concentrations

Based on the information above, 95/95 UTLs are an appropriate statistical metric, following the removal of outliers, for calculating background concentrations from the SLAAP background sample population.

Modification to Arsenic Background Concentration

Recent review of the SLAAP background values revealed a transcription error for arsenic. The reported background concentration of 13.2 milligrams per kilogram (mg/kg) should actually

be 12.3 (mg/kg). This was determined by calculating the 95/95 UTL for arsenic. The sample population for arsenic, as presented in the 2004 environmental baseline survey report, is as follows: 3.4 mg/kg, 5.1 mg/kg, 5.3 mg/kg, 5.7 mg/kg, 6.3 mg/kg, 6.8 mg/kg, 7.4 mg/kg, 8.1 mg/kg, 10 mg/kg, and 18 mg/kg. As noted in Table 4-1 of the 2004 environmental baseline survey report, the concentration of 18 mg/kg was identified as an outlier and removed from the sample population. With removal of the outlier, the remaining sample population has a mean of 6.46 mg/kg and a standard deviation of 1.92 mg/kg. With n = 9 samples, k = 3.031, and the 95/95 UTL should be 6.46 + 1.92 x 3.031 = 12.3 mg/kg.

To address this transcription error, the screening level for arsenic will be revised to 12.3 mg/kg in the RI report.

Conclusions

Outliers were removed from the SLAAP background sample population before background statistics were calculated. Given the considerations presented in this memorandum, the Army made an appropriate choice in selecting the 95/95 UTL as the statistical metric for the calculation of background concentrations. A transcription error was discovered for the arsenic background concentration, so the screening level for arsenic will be revised to 12.3 mg/kg in the RI report for the former Hanley Area. Otherwise, the background dataset, resulting 95/95 UTLs, and their use in developing screening levels have received approval from MDNR and will remain unchanged in the RI report.

References

CH2M HILL. 2008. *Work Plan, Remedial Investigation Report, St. Louis Ordnance Plant, Former Hanley Area, St. Louis.* Missouri. May.

CH2M HILL. 2009. *Remedial Investigation, St. Louis Ordnance Plant, Former Hanley Area, St. Louis, Missouri.* Draft Final. March.

URS Group, Inc. 2004. *Site-specific Environmental Baseline Survey, St. Louis Army Ammunition Plant, St. Louis, Missouri.* May.

USEPA. 1992. *Statistical Analysis of Ground-water Monitoring Data at RCRA Facilities,* addendum to Interim Final Guidance.

USEPA. 2006. *Data Quality Assessment: Statistical Methods for Practitioners.* Office of Environmental Information, Washington, D.C. 2006.

USEPA. 2009. *ProUCL Version 4.00.04 Technical Guide (Draft).* Office of Research and Development.

DEC 1 0 2009

Mr. James D. Daniel
Cleanup Division Chief
United States Army Environmental Command
5179 Hoadley Road
Aberdeen Proving Ground, MD 21010-5401

Re: EPA Response to St. Louis Army Ammunition Plant Background Evaluation
       Hanley Area Operable Unit – Operable Unit 1
       St. Louis Ordnance Plant, St. Louis, Missouri

Dear Mr. Daniel:

The United States Environmental Protection Agency (EPA) has received your letter regarding the Background Evaluation for the Hanley Area at the St. Louis Ordnance Plant dated September 11, 2009. EPA appreciates the United States Army Environmental Command's (AEC) commitment to the clean up of the Hanley Area.

After review of your letter and CH2MHill Technical Memorandum to EPA's comments regarding the background evaluation with the Hanley Remedial Investigation, EPA believes the use of 95 percent UTL is inconsistent with EPA policy and guidance and inconsistent with the Department of Defense's practices of evaluating background for a CERCLA caliber remedial investigation. EPA also believes that AEC's position is based on AEC's contract obligation to meet the milestones of its contract rather than producing a statistically defensible remedial investigation background evaluation. Enclosed is EPA's response to CH2MHill's Technical Memorandum.

EPA would sincerely like to move forward with the Feasibility Study but cannot agree with AEC's current position with respect to the background evaluation in the Hanley Remedial Investigation. An EPA approvable Remedial Investigation would include one of the following alternatives:

- Recalculate the background statistics using ProUCL instead of the 95 percent UTL and remove statistical outliers.

- Resample for the background given that the primary issue with the background evaluation stems from small background data after removing statistical outliers.

- With the concurrence of the Missouri Department of Natural Resources (MDNR), reevaluate metals using the Quantile Plot Analysis similar to the February 2005 Final Background Characterization for Lake City Army Ammunition Plant.

EPA recommends submitting an addendum to Hanley Remedial Investigation with one of the alternatives along with a response to this letter. If you have questions or concerns, please contact me at (913) 551-7520.

Sincerely,

Matthew Jefferson
Remedial Project Manager
Missouri/Kansas Remedial Branch
Superfund Division

Enclosure

cc: Jesse Scott, Missouri Department of Natural Resources
Andrew Maley, AEC (via e-mail only)
Jonathan Harrington, AEC (via e-mail only)
Josephine Newtow-Lund, ACE (via e-mail only)
Chris English, CH2MHill (via e-mail only)
Filippe Cade, Professional Environmental Engineers, Inc. (via e-mail only)

EPA's Response to the CH2MHill Technical Memorandum: Evaluation of Background Concentrations used in the St. Louis Army Ammunition Plant Environmental Baseline Survey

The sole use of 95 percent UTLs for evaluating background is not consistent with EPA guidance and policy. EPA background guidance recommends a statistical analysis for comparing background to site concentrations. Note that the UTL tests for outliers. UTLs can be useful for identifying hot spots when the mean site concentration is similar to background. However, alone it is generally not to be used for comparing background to site concentrations for the purposes of risk-based screening in human health risk assessments. In other words, it should not serve as the bright line that every site concentration below the 95 percent UTL is background and not impacted by site contamination and every concentration above it is impacted by site-related contamination. Given the variability of metals concentrations in soils, there will be overlap between the populations and samples impacted by site-related contamination are likely to fall below the background UTL. Consistent with guidance, a more rigorous analysis of background should be conducted and documented consistent with EPA's 2002 Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. Additionally, ProUCL software can perform hypothesis testing on background and site concentrations. Of course this analysis requires the collection and use of a reliable background data set.

Furthermore, it is worth pointing out a couple of weaknesses in the U.S. Army Corp of Engineers' UTL estimate for arsenic. First and foremost, CH2MHill UTL assumed a normal distribution and did not rely on ProUCL background statistics software to confirm the data distribution nor identify the preferred background level threshold value (BTV). Upon using ProUCL, we found that the arsenic data set [minus the 18 milligrams per kilogram (mg/kg) outlier] appears normal at a 5 percent significance level. Per the output file, ProUCL recommends using the upper prediction limit (UPL) for the BTV which is 10.21 mg/kg [95 percent UPL(t)]. Additionally, the UTL is based on the minimum number of samples recommended in EPA's ProUCL 4.00.04 Technical Guide and User's Guide for conducting background statistics. In fact, the ProUCL background output file for the arsenic data set warns against the use of the resulting calculations given the small data set.

With regard to CH2MHill's support for using the 95 percent UTL over EPA's recommendations, the response provided fails to account for the relatively weak background data set (i.e., small sample size). Instead, the response is a general discussion that provides the differences between the 95 percent UTL and the 95 percent UCL and how skewness (and to a much lesser degree the number of background samples) can alter the odds of the UTL being above the maximum detection. Notwithstanding the size of the data set, the data are normally distributed. Note that CH2MHill's response to EPA's recommendations fails to address the uncertainties with the site-specific background data set (small sample size) and how it would impact the UTL. Additionally, CH2MHill's response does not account for the fact that site and background populations can overlap. As noted previously, the 95 percent UTL does not serve as a bright line between background and site-related contamination.

Despite our recommendations and findings regarding the evaluation of background and BTV, please note that EPA's 2002 Role of Background in the CERCLA Cleanup Program clearly states that constituents exceeding the risk-based screening levels (including naturally occurring elements) should be retained in the risk assessment. Per that document, site-specific background issues should be addressed at the end of the risk assessment. In other words, background levels should not be used for screening constituents from a risk assessment, especially when background levels exceed risk-based screening levels. Therefore, regardless of the methods used to evaluate background, if CH2MHill used background concentrations to screen constituents from the risk assessment that exceeded risk-based screening levels, then they are being inconsistent with EPA guidance and policy.

Finally, depending on the results of the background evaluation (using hypothesis testing) in the risk assessment, the use of the UTL may be appropriate when setting cleanup goals and after considering other site-specific information (e.g., cumulative risks, acceptable risk levels). Cleanup goals for naturally occurring elements could be based on 95 percent UTL in instances where it does not result in cumulative risks that exceed defined risk thresholds (e.g., 10^{-4}, 10^{-5}, or HI = 1). Of course a statistically defensible number of background samples should be collected.

TABLE 2

Chronology of USEPA Comments and Army Responses on the Former Hanley Area Remedial Investigation Report

Former Hanley Area, St. Louis, Missouri

Date	Activity
3/19/2009	Army submits draft remedial investigation (RI) report to the Missouri Department of Natural Resources (MDNR) and U.S. Environmental Protection Agency Region VII (USEPA).
5/1/2009	Army receives RI comments from MDNR and USEPA
5/18/2009	Army submits responses to RI comments (RTCs) to MDNR and USEPA
6/3/2009	Teleconference with MDNR and USEPA held to discuss/resolve RI comments
6/3/2009	Army submits revised RTCs to MDNR and USEPA comments, per the 6/3/2009 teleconference
6/29/2009	After reviewing the 2004 SLAAP Environmental Baseline Study (EBS) Report, USEPA expresses concerns over the use of SLAAP background concentrations to develop RI screening levels for several metals and PAHs in the RI report
7/21/2009	USEPA proposes an alternative approach to addressing concerns on the use of SLAAP background concentrations: re-run risk calculations after the remedial action is complete. Army responds on the same day to this approach, noting the conditions under which the re-evaluation would be performed.
8/5/2009	USEPA expresses concerns with the use of Upper Tolerance Limit (UTLs) instead of Upper Confidence Limits (UCLs) to calculate background concentrations in the 2004 SLAAP EBS Investigation report.
9/11/2009	USAEC submits a letter to USEPA acknowledging USEPA's concerns, but noting their intent to proceed with finalizing the RI. The letter includes a technical memorandum justifying the Army's use of the UTL instead of the UCL for calculating background concentrations.
12/10/2009	USEPA submits a response to USAEC's letter and provides three alternatives to moving the site forward: (1) Recalculate the background statistics using ProUCL instead of the 95 percent UTL and remove statistical outliers. (2) Resample for the background given that the primary issue with the background evaluation stems from small background data after removing statistical outliers. (3) With the concurrence of MDNR, reevaluate metals using the Quantile Plot Analysis similar to the February 2005 Final Background Characterization for Lake City Army Ammunition Plant.
12/17/2009	MDNR submits a letter recommending the third option proposed in USEPA's December 10 letter. MDNR recommended quantile plot analyses for four chemicals: arsenic, benzo(a)pyrene, benz(a)anthracene, and benzo(b)fluoranthene.
1/22/2010	Teleconference with MDNR and USEPA held to discuss RI path forward. Participants agree that a preliminary remediation goal (PRG) for arsenic will be developed using a quantile plot analysis during the feasibility study (FS). Further evaluation of benzo(a)pyrene, benz(a)anthracene, and benzo(b)fluoranthene is not warranted because these chemicals did not pose unacceptable risk in the human health risk assessment.
2/1/2010	Army submits a draft RI cover letter describing the path forward agreed upon during the January 22, 2010 teleconference
2/5/2010	MDNR and USEPA provide comments on the RI cover letter.
2/8/2010	Army submits the final RI report to MDNR and USEPA.